Claims

1.   A valve assembly comprising a housing (2) in which a first flow passage (7), a valve chamber (9) of a shut-off valve (8) and a second flow passage (10, 23) are provided in the mentioned order,

    a diaphragm (13) hermetically covering the valve chamber (9),

    the first flow passage (7) having one end opened into an inner surface of the valve chamber (9) to which a mid portion of the diaphragm (13) is opposed, and

    a valve seat (15) formed around an opening at one end of the first flow passage (7),

    the shut-off valve (8) being opened and closed by allowing the diaphragm (13) to approach and separate from this valve seat (15), wherein

    a groove portion (18) is formed in the inner surface of the valve chamber (9) at a periphery of the valve seat (15) and is provided with an groove outlet/inlet (19) which is opened in an area larger than a circle having a diameter of a groove width (w), and

    the second flow passage (10, 23) communicates with the valve chamber (9) through the groove outlet/inlet (19) and the groove portion (18) in the mentioned order.

2.   The valve assembly as set forth in claim 1, wherein at least part of the groove outlet/inlet (19) is opened into a groove side surface (20).

3.   The valve assembly as set forth in claim 1 or 2, wherein at least a portion of the groove outlet/inlet (19) side of the second flow passage (10, 23) is inclined with respect to an axis (22) of the first flow passage (7).

4.   The valve assembly as set forth in any one of claims 1 to 3, wherein the groove portion (18) has a groove bottom surface (21) which increases its depth toward the groove outlet/inlet (19).

5.   The valve assembly as set forth in any one of claims 1 to 4, wherein the second flow passage (10, 23) communicates with the groove portion (18) from a tangent direction.

6.   The valve assembly as set forth in any one of claims 1 to 5, wherein the largest depth (h) of the groove portion (18) is of a dimension not less than 30% of the groove width (w),

7.   The valve assembly as set forth in any one of claims 1 to 6, wherein the largest depth (h) of the groove portion (18) is of a dimension at least equal to the minimum diameter (d) of the first flow passage (7).